

# ToK BoX



## Reasoning.

An important aspect of studying hazards is understanding and explaining the causes and effects of certain hazard events. Sometimes, the cause-and-effect links are unclear, and reasoning is required to explain the sequence of events.

Quite simply, reasoning is the use of the mind to think, understand and form judgements using a process of logic. There are two types of reasoning, inductive and deductive.

Deductive reasoning is chain of logic where one proposition leads to another, and thus the conclusion has 100% certainty, provided the assumptions are accurate. For example:

All men are mortal  
I am a man  
Therefore, I am mortal

On the other hand, in inductive reasoning, a number of observations provides evidence that leads to a conclusion. The greater the number of observations, the more reliable the conclusion. For example:

We see 30 swans  
They are all white  
We see 3000 swans  
They are all white  
Therefore, all swans are white

Inductive reasoning never gives certainty because it takes only one exception (which may not yet have been tested or discovered) to make a claim invalid. On the other hand, deductive reasoning, which is used widely in mathematics, is capable of giving certainty provided the assumptions are correct.

However, it is important to understand the logical patterns used in deductive reasoning. Consider the following argument, and ask yourself whether it is valid:

If human-induced global warming is really happening, then the polar ice caps will be melting.

The polar ice caps are melting.

Therefore, human-induced global warming is really happening.

In this case, the argument is not valid. It follows the form:

If p, then q

q

Therefore p

This is an example of a particular type of logical fallacy known as 'affirming the consequent'. It may be easier to see why it is a logical fallacy if we use a different argument that follows the same structure:

If it's Monday the banks will be open.

The banks are open.

Therefore, it's Monday

You can test how well you understand logical fallacies and reasoning by considering the seven 3-line arguments that appear below. For each argument, decide whether (a) the assumptions are true or false, (b) the conclusion is true or false, and (c) whether the argument is valid or invalid.

For each argument, the assumptions are found in the first two lines. The conclusion is found in the third (last) line.

Whether the argument is valid or not is determined by whether or not the conclusion flows logically from the preceding assumptions (regardless of whether it is true or false).

When you have decided whether (a) the assumptions are true or false, (b) the conclusion is true or false, and (c) whether the argument is valid or invalid, write the number of the argument in the correct rectangle in the appropriate box below.

Argument 1:

China is in Africa  
Moscow is in China  
Therefore Moscow is in Africa

Argument 2:

China is in Africa  
Moscow is in Africa  
Therefore Moscow is in China

Argument 3:

China is in Asia  
Shanghai is in Asia  
Therefore Shanghai is in China

Argument 4:

China is in Asia  
Shanghai is in China  
Therefore Shanghai is in China

Argument 5:

China is in Africa  
Cairo is in China  
Therefore Cairo is in Africa

Argument 6:

China is in Africa  
Shanghai is in Africa  
Therefore Shanghai is in China

Argument 7:

China is in Asia  
Shanghai is in Asia  
Therefore Shanghai is in China

You should be able to write one number in each of seven rectangles, leaving one rectangle blank.

Check your answers in the next ToK BoX, which is on page 346.

### VALID ARGUMENTS

#### True Conclusion

#### False Conclusion

True Assumptions

False Assumptions

### INVALID ARGUMENTS

#### True Conclusion

#### False Conclusion

True Assumptions

False Assumptions